Low-Power, High-Influence: A Case of IT-enabled Open Strategy Formulation

ABSTRACT

Despite the advocation for wider participation in strategy formulation, the literature is still dominated by perspectives that emphasize the importance of top and middle managers. In this paper, we focus on the role and potential of low-power actors that reside outside of management positions and influential departments in open strategy formulation. Building on a unique mixed methods study of an IT-enabled open strategy process deployed in a multinational online payments firm, we examine how low-power actors participate and what impact their participation has on the acceptability of ideas generated. Interestingly, low-power actors were more strategically productive than high-power actors, and ideas were most acceptable among the collective when they were solely produced and co-developed by low-power actors and void of any high-power involvement.

Keywords: open strategy formulation; power bias, low-power; participation; information technology

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INTRODUCTION

Both strategy process and practice literature acknowledge strategy formulation to be a distributed and socially complex activity arising from the actions and interactions of actors spread across hierarchical levels and functional subunits (Burgelman, 1983a; 1983b; Floyd and Lane, 2000; Jarzabkowski, 2005; Noda and Bower, 1996; Regnér, 2003). The commonly accepted view is that the formulation process is inherently political, driven by myriad interests of multiple actors (Eisenhardt and Zbaracki, 1992; Narayanan and Fahey, 1982). This political nature manifests in competing interactions among various organizational coalitions, which inevitably involves an exercise of power (Astley and Sachdeva, 1984; Jarzabkowski and Balogun, 2009). Thus, the firm's strategic direction is often a reflection of the power asymmetries that exist between organizational actors, as power 'wins the battle of choice' (Eisenhardt and Zbaracki, 1992).

Prior studies have shown that low-power actors, such as frontline employees and individuals from peripheral departments, are often ignored or excluded due to a status disattribution bias that favors the organizationally powerful (Ketokivi and Castañer, 2004; Reitzig and Sorensen 2013). Calls to overcome such bias are central to the recent notion of open strategy formulation (OSF), which advocates for a higher degree of internal inclusivity and participation beyond the top management team and influential middle managers (Whittington, Basak-Yakis, and Cailluet, 2011). Research suggests that low-power actors are particularly important constituents to the formulation process, as they generate ideas that are practically relevant and critical to new knowledge creation (Mantere and Vaara, 2008). Yet, involving low-power actors is a difficult task, as they have less role autonomy to participate, assume a position of deference to high-power actors, and lack the political assets to contribute. This poses the conundrum of how to involve low-power actors in OSF.

Recent studies have identified information technology (IT) as a potential solution to this conundrum (e.g., Stieger et al., 2012; Whittington, 2014; 2015) since it allows for the production and co-development of ideas without associating actors to their organizational power status. However, IT may also instantiate negative effects by allowing actors to interact in ways that intensify politicking through the blocking or gaming of information flows (Jarzabkowski and Kaplan, 2015; Kaplan, 2008), thereby overemphasizing the very power asymmetries it is deployed to negate. Thus, despite the increased possibilities of IT to enable more open forms of strategizing (e.g., Stieger et al., 2012), our understanding of its value is limited (Whittington, 2014; 2015), especially in the context of low-power actor participation and consequences thereof.

To address this gap, our study examines a unique case of IT-enabled OSF within a large multinational online payments organization experiencing problems of participation and strategic misalignment owing to high power asymmetries. Our guiding research question is: *Can the power biases that inhibit the participation of low-power actors be mitigated with IT-enabled OSF?* Empirically we utilize a novel dataset that documents the interactions of power differentiated actors as they produced and co-developed strategic ideas. We used the data gathered to quantitatively examine two analytical questions relating to our primary research question: (1) how do low-power actors participate to IT-enabled OSF; and (2) what impact does low-power actor participation have on the acceptability of ideas generated? We found that low-power actors embrace IT-enabled OSF by participating proportionately greater than high-power actors, generating more strategic ideas and engaging more intensely in their co-development. Interestingly, we also found that strategic ideas were most acceptable among the participating low-power and high-power collective when they were void of any high-power actor involvement–where they were both generated and co-developed by low-power actors.

Our study makes two critical contributions to strategy process and practice. First, we advance a low-power actor perspective of strategy formulation by demonstrating their importance through the 'trifecta' of idea production, co-development, and acceptance during OSF. While prior studies have emphasized the role that high-power actors such as top managers (Floyd and Lane, 2000), influential middle managers (Floyd and Wooldridge, 2000), and actors from departments that control critical contingencies (Pfeffer and Salancik, 1974) play in the strategy process, research to date has yet to address the role of low-power actors that reside outside of such positions. Second, our study represents an early step forward in examining dynamics of participation in IT-enabled processes of strategizing and answers recent calls in the literature for research at the intersection of strategy-as-practice and IT (e.g., Whittington, 2014; 2015) by revealing IT as a critical OSF practice enabler.

THEORY BACKGROUND

We begin by reviewing the literature on strategy process and practice that allowed us to identify the power biases that exist in strategy formulation, before connecting the insights generated to the concept of OSF and issues of participation among low-power actors. Next, drawing from the literature on IT-enabled communications from information systems, we position IT as critical practice enabler for overcoming the power biases that inhibit low-power actor participation to generate our research questions.

Power biases in strategy formulation

According to the widely accepted political model of strategy formulation, an actor's ability to influence the firm's strategic direction (Pettigrew, 1973) and allocation of resources

(Bower, 1970; Burgelman, 1983b) is determined by the power that they have at their disposal (Narayanan and Fahey, 1982). From this perspective, the organization is viewed as a political system in which "each player pulls and hauls with the power at his discretion for outcomes that will advance his conception of interests" (Allison, 1971: 171). Given that relational dependencies and cognitive biases are a natural by-product of any structural arrangement of the organization, such as those manifest vertically in hierarchical levels or horizontally across functional departments owing to operational workflows and the division of labor (Astley and Zajac, 1991; Hinings et al., 1974; Ketokivi and Castañer, 2004; Salancik and Pfeffer, 1974), power asymmetries between organizational actors are an inherent reality within all firms.

Early bureaucratic theories of the organization first emphasized legitimate authority, rooted in an actor's hierarchical position, as the most critical form of power asymmetry influencing strategic decisions. Power here emerges by order of formal decree, where subordinates assume a position of deference to and are biased towards the views of actors that occupy a relative position of power within the organization's hierarchy (Astley and Sachdeva, 1984). Strategic contingency theorists, however, later asserted that an actor's subunit or departmental affiliation owing to resource endowments (Pfeffer and Salancik, 1974; Salancik and Pfeffer, 1974) and workflow dependencies (Hickson et al., 1971; Hinings et al., 1974) as an important source of power. From the perspective of resource endowments, actors are argued to gain power commensurate to the resources that their department controls that others depend, especially when such dependence is asymmetric or non-substitutable (Astley and Zajac, 1991). The seminal studies of Pfeffer, for example, demonstrated how powerful actors from university departments that had access to grant funds and student enrollment resource were able to obtain a higher allocation of the university's budget. Similarly, workflow dependencies embodied by departmentally specialized roles also create power asymmetries, as actors accrue strategic influence by performing activities that are instrumental to the organization's collective functioning (Astley and Zajac, 1991). Furthermore, in addition to tangible manifestations of power attributed to an actor's departmental affiliation, prior studies have also shown that top management perceptions of value congruence, defined as the degree of perceived overlap in values with an actor owing to their departmental affiliation, is also a significant predictor of one's power to influence strategic issues (e.g., Enz, 1988).

In summarizing the aforementioned sources of power asymmetry, it is evident that the strategy formulation process is biased towards actors that occupy adequate hierarchy, or are affiliated to a department that control critical contingencies or possess high levels of managerial value congruence, or any combination of the prior. The danger of this scenario is the prominence afforded to a small number of high-power actors in the formulation process, which ignores the potential contributions of actors outside of these positions. In the next section, we discuss the implications of this for participation in OSF.

Open strategy formulation

Building on the notion of open innovation, OSF refers to the process by which organizations increase the inclusivity and transparency of their strategy formulation activities to a wider cohort of internal and external actors (Hautz, Seidl, and Whittington, 2017; Whittington et al., 2011). Inclusivity is defined as the degree of participation extended by the firm in the production and co-development of ideas that are intended to shape the organization's strategy; whereas transparency is defined as the degree of visibility afforded by the firm regarding the content of strategy, and encompasses the exchange of information and knowledge (Whittington et al., 2011). Firms are increasingly shifting away from an internally 'closed' process of strategy formulation centered around the top management team, towards a model that involves the engagement and participation of multiple actors distributed across hierarchical levels and functional departments (Chesbrough and Appleyard, 2007; Mack and Szulanski, 2016). The underlying rationale is that the opening of strategy “will widen the search for strategy ideas and improve commitment and understanding during implementation” (Whittington et al., 2011: 535).

Prior research on the process and practice of strategy formulation has long acknowledged the importance of increased internal participation of middle managers in driving organizational commitment (Guth and MacMillan, 1986), strategic convergence among subunits (Ketokivi and Castañer, 2004), and joint sensemaking (Gioia and Chittipeddi, 1991; Gioia et al., 1994), suggesting that a lack of participation can lead to poorly developed strategies (Floyd and Wooldridge, 2000), dissatisfaction among the excluded (Westley, 1990), and difficulties in collective understanding (Mintzberg, 1994). The close proximity of mid-level managers to both the top management team and frontline operations makes them an important intermediary channel for disseminating information about markets, technologies, competitors, and other strategic opportunities that can only be sensed and seized on the organization’s periphery (Gavetti, 2005). As Regnér (2003) shows, managers that reside in the organization’s periphery are better positioned to explore the external environment and deploy new strategic initiatives, while those in the corporate center are biased towards the exploitation of existing capabilities and maintenance of the status-quo. If this is the case, then the participation of frontline employees and other low-power, peripheral actors that reside outside of high-power managerial and departmental positions may even more relevant for OSF.

Thus, a major factor underpinning the opening of strategy is the ability of all organizational actors to participate in the strategic conversation and contribute towards the production and co-development of strategy ideas, particularly those characterized by low-power. Yet, involving low-power actors is a difficult task as they are often ignored or excluded due to the power biases associated with their vertical and horizontal position within the organization (e.g., Ketokivi and Castañer, 2004; Reitzig and Sorensen 2013). Since employees tend to identify with their socialized role in the formal structure, they exhibit a position bias that gives shape to action and serves as the criteria through which their behavior is guided (Floyd and Lane, 2000; Vaara and Whittington, 2008). Every organizational role is associated with normative expectations that constrain actors to the institutionalized limits of their position. Therefore, given that the practices and discourse of strategy formulation are historically oriented towards managers (Mantere and Vaara, 2008; Samra-Fredericks, 2003; 2004) and other powerful actors from departments that control critical contingencies or align with top management values, individuals outside of these roles may find it difficult to participate in the production and co-development of ideas. Furthermore, positional bias has also been found to induce selective perceptions during OSF that can lead to the exclusion of low-power actor ideas despite deliberate efforts of inclusion, as “higher status sources are perceived as being of higher potential value” (Reitzig and Sorensen, 2013: 787) even by other low-power actors. The question is, therefore, how can firms circumvent the power biases that inhibit the participation of low-power actors in OSF?

Information technology as open strategy formulation practice enabler

When it comes to the practices that enable or constrain participation in strategy formulation, recent studies have eluded to the importance of technology as a mediating artifact (Vaara and Whittington 2012). Strategy work is intimately linked to material technologies such PowerPoint (e.g., Kaplan, 2008; 2011) that serve as both an important medium and outcome of strategy formulation and provide actors from across hierarchical levels and departmental boundaries with a means to contribute and shape strategic issues. Yet, such technologies may also reify power asymmetries in the hands of powerful actors

(Jarzabkowski and Kaplan, 2015), as not all actors have the ability to access or shape the agendas that they carry (Mantere and Vaara, 2008), thereby limiting participation in the production and co-development of strategy ideas. However, there are opportunities to push the boundaries of inclusion and enroll employees at all organizational through interactive technologies drawn from social media, such as crowdsourcing (e.g., Stieger et al., 2012).

Studies on IT-enabled communications from information systems have identified several components of interactive technologies that provide increased possibilities for low-power actor participation, namely anonymity; parallelism; and group memory. Anonymity, defined as the degree to which an actor perceives the message source as unknown or unspecified (Scott, 2004), has received replicated support in the literature for the positive effect it has on the willingness and volume of participation observed in IT-enabled group discussions (e.g., Dennis et al., 1997; Dennis, Wixom, and Vandenberg, 2001), particularly among low-power actors (Nunamaker et al., 1991). By removing social barriers, anonymity is argued to reduce pressures for conformity and encourages participation among a wider cross-section of actors (Dennis and Garfield, 2003). The second component, parallelism, refers to the ability of actors to exchange information simultaneously. In traditional face-to-face settings, high-power actors control the direction and content of strategic dialogues, which limits the generation of ideas from more peripheral, low-power actors, a concept known as "production blocking" (Gallupe et al., 1994; Valacich, Dennis, and Terry, 1994). Parallelism mitigates such blocking as actors do not have to wait turn to contribute, which promotes equal access to strategic conversations and increases the possibilities for participation (Dennis, 1996). Finally, group memory refers to the collective ownership, documentation, and distribution of ideas submitted by actors. By reducing dynamics of control and ownership of content and medium among powerful actors, group memory also promotes equal participation (Dennis and Garfield, 2003; Tyran et al., 1992).

Furthermore, the process and information structuring capability of IT may also provide increased possibilities for participation. Process structuring refers to the conditioning effects of technology that imposes rules with regards to how interactions take place and “directs the pattern, timing, and content of communication among strategic planning participants” (Dennis et al., 1997: 159), such as how ideas are submitted, voted on, and edited. According to Dennis et al. (1997), process structuring stimulates synergies and the cross fertilization of ideas among actors. Information structuring, on the other hand, is the conditioning effect of technology on task information, such as how information is gathered, shared, aggregated, and evaluated, which can help with the “crafting” of solutions in situations of conflict and contestation (Zigurs and Buckland, 1998).

Accordingly, we posed the following primary research question: *Can the power biases that inhibit the participation of low-power actors be mitigated with IT-enabled OSF?* In posing this question our empirical analysis lends itself towards the examination of two analytical sub-questions: (1) how do low-power actors participate to IT-enabled OSF? and (2) what impact does low-power actor participation have on the acceptability of ideas generated?

RESEARCH CONTEXT

We situate our study within ECOM Corp (a pseudonym), a multinational provider of online payment solutions serving over 36 million consumers worldwide. ECOM Corp was considered to be a theoretically relevant case to base our study for two reasons: First, the company was experiencing problems of participation and strategic misalignment owing to power asymmetries associated with an actor’s hierarchical level and departmental affiliation. Second, the IT-enabled OSF process deployed as an intervention represents a “revelatory” context (Eisenhardt and Graebner, 2007) with which to examine the dynamics and outcomes of participation in relation to our analytical research questions. In the following, we document the specifics of the case and IT used to contextualize our study.

ECOM Corp was established in 2002 as a domestic small to medium sized enterprise and quickly expanded into a large multinational with more than 1,800 employees. As consequence of such rapid growth, however, the company started facing problems of strategic misalignment owing to actors from the two most powerful departments exerting their influence. The competing rationalities of the engineering and risk department regarding the company's internationalization strategy created two major challenges: (1) the exclusion and lack of participation among low-power actors from peripheral departments; and (2) strategic misalignment and conflict.

Engineering's priority was to maintain a standardized payments architecture across national marketplaces in order to reduce technical complexity, increase scale, and maximize simplicity; whereas the risk department's priority was to customize payments architectures in order to minimize risk exposure. As one employee stated: "*while there's agreement on 'yes', we need to expand [internationalize] and grow the business; the sticking point is **how** this is going to happen."* This tension was exacerbated given the power attributed to both departments. While actors in hierarchical positions of power had a legitimate mandate in strategy formulation, departmental affiliation was also found to endow actors from engineering and risk with substantial influence due to resource contingencies and managerial value congruence respectively.

Engineering was the most central function that provided technical support and infrastructure for processing customer transactions, managing high sales volumes, and collecting and collating data. This created significant dependencies from other departments that relied on data inputs for developing new product features (Product department) or updating financial reports (Finance department). Such dependencies, coupled with low levels of capability substitution, afforded actors from engineering a prominent voice. Similarly, the risk department also occupied a position of power owing to an overlap in identity with the top management team. The Chief Operating Officer (COO) and Chief Risk Officer (CRO), for example, had an extensive risk management and legal background, and were biased towards actors from risk. This situation was compounded by the strict regulatory environment within which ECOM Corp operated that positioned risk as a priority area.

This bias towards high-power actors excluded any meaningful participation from those in low-power departments and was highlighted in preliminary interviews: *"It's a little crazy how only those [individuals] in engineering and risk dominate decisions… A lot of really good ideas are overlooked because we don't have the same amount of [power];"* (HR department). "*We're kind of pushed to the side, not explicitly, but subconsciously, as we're never consulted, asked, or involved in what goes on… This makes it difficult for us to speak out or get our voices heard*" (Finance department). The CEO echoed this sentiment: *"It's not like it was before [as an SME] when we could get everybody in a room and get everyone [strategically] aligned. The reality is much more complex now, to the point that our [departments] are not working together. Individuals are pursuing their own agendas and leveraging their [hierarchical and departmental] influence over others to do that. Ultimately, this has affected our performance and impacted the strong team spirit we had before*.

Thus, a short-term high priority objective was set to align departments and hierarchical levels in an integrated strategy statement and vision. To achieve this, the CEO looked towards IT to facilitate a structured OSF process among a sample of employees from across the organization. The IT-enabled OSF process spanned an intense 6-day period, with 129 participants being randomly selected with a narrow restriction of achieving an equitable distribution across the six departments—*engineering*, *finance*, *human resources (HR)*, *operations*, *product*, and *risk*; and three hierarchical levels—*operational*, *operational-*

management, and *middle management*. A total of 21 participants were selected from each of the three smallest departments (*HR*, *Risk*, and *Finance*) and 22 for the three remaining larger departments. Participants were told that they were selected to take part in an anonymous open strategy initiative with the aim of generating ideas to address the strategic misalignment issues and develop capabilities to support the corporate strategy. The stated objective was: "*What are the key strategic issues that need to be addressed (and how) in order to plan and align the activities of the organization to the overall corporate internationalization strategy?*" Contributors of the top ten ideas were then invited to a strategy workshop to embed their ideas into a formal strategy statement.

The IT used for the OSF process supported idea production, co-development, and evaluation, and featured several components to stimulate participation, including anonymity, parallelism, and group memory (e.g., Dennis et al., 1997). Participants had open access to all ideas and were able to engage in the anonymous and simultaneous production of new ideas with no restrictions in number submitted. Ideas submitted were restricted to 600 characters to keep content focused. In parallel, any participant could suggest an edit to any idea, limited to a 30 percent change, to facilitate co-development. Furthermore, the process and information structuring capability of the IT-enabled process (e.g., Zigurs and Buckland, 1998) emphasized source content over contributor, as ideas were sampled to participants for evaluation in a structured pairwise voting procedure to determine rankings[1]. This process was automated to ensure that all ideas were given fair exposure and evaluated on content. Participants voted for ideas with the highest perceived benefit to the stated objective. Suggested edits were also subject to a pairwise voting procedure and only accepted if the majority perceived it to be an improvement on the original.

[1] A proprietary ranking algorithm drives the outcomes of this process to ensure that ideas are presented in a consistent way among the collective. Additional details of the ranking process are provided in Appendix A.

Thus, in considering these contextual factors it is evident that this case provides fertile ground to examine the dynamics and outcomes of participation in IT-enabled OSF in a power asymmetric context.

METHODS

Data collection

To develop a well-grounded examination of IT-enabled OSF, we employed a mixed-method approach combining qualitative and quantitative techniques (Yauch and Steudl, 2003). Specifically, we combined ethnographic insights, automated log data from the IT-enabled process, and two short peer-rating surveys distributed to all 129 invited participants and senior managers prior to the event in order to construct a novel dataset for quantitative analysis. Such a hybrid approach is recommended for theory that is at intermediate stages of development, as is the case for OSF, and often draws on separate streams of literature to propose new theoretical insights (Edmondson and McManus, 2007). Thus, it is well suited to the aim and set-up of our study.

We were granted full access by ECOM Corp to trace idea developments and collect log data in real-time as the open strategy event took place via an online ethnography of the IT-system. This comprised full documentation of all participant interactions in idea production, co-development, and evaluation. A total of 81 out of 129 actors participated in at least one of the three aforementioned interaction activities, through which we tracked 132 strategy ideas, 314 edits, and over 3,000 idea votes. We supplemented these data with two short peer-rating surveys: one distributed among all 129 invited participants regarding departmental resource contingencies and the other among the top management team regarding value congruence; to establish the different positions of power held by participating actors. We achieved a perfect response rate, which we attribute to the questions being sent out on behalf of the CEO. The resulting dataset was then used to quantitatively analyze the dynamics and outcomes of IT-enabled OSF.

Variables and measures

Our dependent variables were extracted from the interactions and outcomes observed during the IT-enabled OSF process, while our independent variable measure of an actor's degree of power asymmetry was derived from the peer-rating survey instruments.

Dependent variables

Our first set of dependents were operationalized to address our first analytical sub-question of how do low-power actors participate to IT-enabled OSF. To answer this question, we considered the *total interactions* that a given actor engaged in during the open strategy process, computed as the summation of *idea production, idea edits* (co-development), and *idea votes* (evaluation) to account for whether a given actor participated or not. For instance, an actor that contributed 6 ideas, 3 edits, and 32 votes counts as 41 interactions. We also treated these three different forms of participation as separate dependent variables to examine potential variations in how actors contributed to the process. All values derived were proportionately weighted by the number of actors present at a given level of the *power asymmetry* index.

In relation to our second analytical sub-question of what impact does low-power actor participation have on the acceptability of ideas generated, we created another dependent that measures *idea acceptance*. Idea acceptance is a log-transformed variable[2] of an idea's ranking according to the outcomes of the overall pairwise voting procedure of the IT-system. Idea rankings are determined by a unique pairwise voting procedure that samples pair choices

[2] We log-transformed idea ranking to normalize residuals for OLS regression.

to participants for evaluation to ensure that all ideas are given a proportionate number of votes among the collective, which we inversely weighted by the number of actors at a given power level. As such, these rankings were considered to be a valid indicator of the collective acceptance of a given idea (see Appendix A).

Independent variables

Power asymmetry. Similar to Van der Vegt et al. (2010), we used a peer-rating approach to establish the different positions of power occupied by actors according to resource contingencies and managerial value congruence to operationalize a simple index measure of *power asymmetry*. By developing a continuous measure, we account for broader connotations of power and are able to distinguish between high, medium, and low-power actors at different degrees of asymmetry. We asked all 129 invited participants to rank the six departments based on resource contingencies: "Considering a department's provision of resources that other departments depend, please rank departments by order of importance," (1= "most important," 6 = "least important"). For value congruence, we asked the top management team: "Considering your personal values (i.e., beliefs, opinions, and principles), please rank departments by order in which you perceive them to overlap," (1 = "most overlap," 6 = "least overlap"). We triangulated these results with our initial qualitative findings presented in the research context to avoid problems of common method bias (Podsakoff et al., 2003).

Responses were re-coded on the interval [0, 5] and aggregated and averaged as relative distance scores, per participant, to establish a departmental rank order of power according to resource contingencies and value congruence. Hierarchical rank was taken as a given by order of an actor's official position within the company, and measured as: 0=middle management; 1=operational-management; and 2=operational. Results of the peer-rating approach are presented in Table 1.

Insert Table 1 about here.

The resultant index is a 12-point relative measure of an actor's power asymmetry from the perspective of three dimensions, such that:

$$PA_i = \sum_{j=0}^{5} RC_{ij} + \sum_{j=0}^{5} VC_{ij} + \sum_{j=0}^{2} HR_{ij}$$

where PA_i is the total power asymmetry of actor i, RD_{ij} is the power asymmetry owing to resource contingencies according to ranking j, VC_{ij} is the power asymmetry owing to perceived value congruence, and HR_{ij} is the power asymmetry owing to hierarchical rank. The degree of asymmetry ranged between 1 and 12 (M=6.13, S.D=2.65), with higher index scores indicating lower power.

Co-development edits. To capture the impact of co-development edits to an idea on idea acceptance, we created four variables—*total edits, low-power edits, medium-power edits*, and *high-power edits* to account for the power of the edit contributor. Total edits refer to the total number of incoming edits to an idea irrespective of its source origin. Low-power edits refer to the total number of edits that originate from a low-power source, measured as the top 75th percentile of power asymmetry. Medium-power edits refer to the total number of edits that originate from within the middle 50th percentile of power asymmetry. High-power edits refer to the total number of edits that originate from the bottom 25th percentile of power asymmetry.

Control variables

We also included a number of individual-level controls. We account for potential differences in organizational experience, as a longer tenure may endow actors with a higher degree of knowledge and, presumably, give them scope for submitting more acceptable ideas. The number of years an actor had been with the organization was used to control for *tenure*. To capture *gender* variations, we coded a dummy variable taking the value 1 for female. For *education,* we coded a dummy variable taking the value 1 for bachelor's degree or higher. We also controlled for an actor's technical *background* by creating a categorical variable for their domain of expertise.

Estimation techniques

We adopted three different quantitative estimation techniques to answer our two analytical sub-questions. First, to examine how low-power actors participated in IT-enabled OSF, we used a Poisson regression. Poisson regression was the most suitable method given the skewed nature of the count participation variables used as dependents (Hilbe, 2011) and flexibility of the underlying data distribution (Dahlander et al., 2016). Second, to examine the patterns of co-development in relation to our first question, we conducted a social network analysis (SNA) of all co-development interactions to establish whether actors had a tendency to form within or between power level co-development ties. Accordingly, we constructed an interaction matrix of all editing dyads formed between participants during the open strategy process. Finally, in relation to our second analytical sub-question, we examined the impact that different patterns of interaction had on idea acceptance by using ordinary least squares (OLS) regression. OLS regression is suitable in this instance due to the log-transformation applied to the idea acceptance dependent and non-violation of normality of residuals assumption.

We performed additional robustness checks of the OLS regression to control for potential self-selection bias using a Heckman estimation. Since participation to the open strategy process was predicated on the endogenous choices of invited participants, the strategizing process observed does not occur randomly and the regression coefficients may therefore be biased (Greene, 2000; Heckman, 1979). A Heckman probit model was used to account for the choice decision of actors to participate in the open strategy process. This approach corrects selection bias by calibrating coefficients using a hazard rate (inverse mills ratio) in a second stage estimation if the differences between 'contributors' [1] and 'non-contributors' [0] in the first stage are found to be statistically significant.

RESULTS

The descriptive statistics and correlations among variables are presented in Table 2. The reported correlations do not implicate multicollinearity as an issue. A check of variance-inflation-factors post regression estimation also confirms this, with all reported values under the threshold of 10.

Insert Table 2 about here.

Table 3 presents the results of the Poisson regression (p-values in parentheses). Models 1a, 2a, 3a and 4a are the baseline models that include only control variables for each of the participation dependents total interactions, idea production, idea votes (evaluation), and idea edits respectively. Models 1b, 2b, 3b, and 4b then include the main effect of power asymmetry. Models 1c, 2c, 3c, and 4c add a squared power term to account for potential non-linear effects in the form of diminishing returns to participation. The 'b' Models all report positive and statistically significant coefficients for power asymmetry at the 99.9 percent level. Specifically, each unit increase in power asymmetry is associated with a 5.8 percent increase in total interactions, 12.3 percent in idea production, 4.3 percent in idea votes, and 8.8 percent in idea edits. Next, the inclusion of squared terms shows a positive curvilinear relationship in Models 1c, 3c, and 4c, indicating increasing returns on participation among low-power actors across all forms of participation, except for idea production (Model 2c) where a positive linear relationship is confirmed. A post-hoc check of these results was conducted by creating a dummy variable of power asymmetry that distinguishes between low-power and high-power actors and a dummy variable that accounts for potential low-power actors from peripheral departments in an operational management or middle management role from which we rerun the Poisson regression. The results affirm our findings, except for in the case of idea votes as low-power and high-power actors showed no significant differences in evaluation activity (see Table S1 in Appendix B).

Insert Table 3 about here.

Table 4 reports the results of the SNA and shows the within and between power-level co-development tie densities, reported as a ratio of expected versus observed ties from 10,000 randomized trials. We created a tripartite distinction of power asymmetry and assigned cut-off points for high-power, medium-power, and low-power actors at the bottom 25th, middle 50th, and top 75th percentiles respectively. Our results show that low-power (1.73), medium-power (1.68), and high-power actors (1.25), exhibit a greater than random propensity, i.e., >1, to form co-development ties with low-power actors, with low-power actors receiving 55 percent more ties than expected. For medium-power and high-power actors, however, our results show a lower propensity for co-development tie formation among actors across all power levels. On average, medium-power actors receive 17 percent less ties than expected while high-power actors receive 61 percent less than expected. The sampling distribution of differences between these trials is used to calculate a chi-square statistic of independence for social networks (e.g., Hanneman and Riddle, 2005), which was significant at the 95 percent level (p=0.04).

Insert Table 4 about here.

Thus, in relation to our first analytical sub-question, the Poisson regression and SNA indicate that low-power actors participate proportionately greater than high-power actors in idea production, co-development, and evaluation, and stimulate more co-development ties from actors across all power levels.

Table 5 reports the results of the OLS regression (p-values in parentheses). Model 1 is the baseline model that only includes controls. Model 2 includes the main effect of power asymmetry and total edits as an additional covariate. Model 3 adds the squared term for power asymmetry. Model 4 includes an interaction variable between power asymmetry and total edits. Model 5 then differentiates between collaborative edits that originate from low-power, medium-power, and high-power actors by introducing three new interaction variables that replace the prior interaction variable in Model 4.

Insert Table 5 about here.

The coefficients for power asymmetry and total edits in Model 2 suggest a direct positive association on idea acceptance at the 99.9 percent level. Specifically, a unit increase in power asymmetry is associated with a 1.7 place increase in ranking, which approximately translates into a 19 place increase moving from the most to the least powerful actors. A unit increase in total edits on the other hand, only increases idea acceptance by 0.176. Model 3 examined potential nonlinearities of power asymmetry and found no significant relationship. Model 4 included an interaction term between power asymmetry and total edits. The positive coefficient indicates the existence of a positive moderation effect. To unpack this effect, we accounted for the power level of the edit source by introducing low-power edits, medium-power edits, and high-power edits as separate interaction variables in Model 5. Interestingly, we find that only low-power edits moderate the effect of power marginality on idea acceptance, while edits from medium and high-power actors do not.

To aid interpretation, Figure 1 plots the marginal effects of low-power edits at three different levels of power asymmetry to account with 90 percent confidence intervals based on Model 5 estimates. Specifically, we plot the marginal effects at the 25th (high-power), 50th (medium-power), and 75th (low-power) percentiles to account for the power level of the idea source. Interestingly, we find that high-power actors are unaffected by low-power edits as a horizontal line fits within the confidence interval. Furthermore, both high-power and medium-power actors consistently underperform low-power actors in terms of generating 'acceptable' ideas. Interestingly, acceptability is highest when ideas from low-power actors are coupled with edits from other low-power actors.

Insert Figure 1 about here.

Finally, Models 6 and 7 report the robustness checks from which we reran Model 2 using a Heckman procedure to account for potential selection bias during the open strategy process. Model 6 provides the results of the first stage probit model and shows that the main effect of power marginality is non-significant. This allows us to conclude that our main findings are robust to selection bias despite there being a significant lambda reported in Model 7 (Certo et al., 2016). A post-hoc check of the OLS results was also conducted by adding a dummy variable that accounts for potential low-power actors from peripheral departments in operational management or middle management positions. The results again affirm our findings (see Table S2 in Appendix B).

CONCLUDING DISCUSSION

Our primary research question asked: Can the power biases that inhibit the participation of low-power actors be mitigated with IT-enabled OSF? Our study answers this question through a quantitative investigation of two analytical sub-questions that examine: (1) how do low-power actors participate to IT-enabled OSF; and (2) what impact does low-power actor participation have on the acceptability of ideas generated? While existing research on strategy formulation tends to focus on the importance and role of the top management team and middle managers (e.g., Floyd and Lane, 2000; Floyd and Wooldridge, 2000; Guth and MacMillan, 1986), little research has accounted for the potential held by low-power actors that reside in peripheral positions outside of management roles and influential departments that control critical resources or possess high levels of managerial value congruence. Our study, therefore, provides an important contribution to the literature on strategy formulation by advancing a low-power actor perspective that highlights the nature, role, and outcomes of their participation.

By examining a context in which an IT-system was used to mitigate the power biases that inhibit participation and address problems of strategic misalignment, we found that low-power actors demonstrate a strong motivation to participate in IT-enabled OSF, as the proportionate volume of activity in idea production, co-development, and evaluation increases in line with an actor's power asymmetry, such that actors become more strategically 'productive' as their power decreases, and this effect intensified. While this finding alone is not entirely unexpected due to the equalizing effects of IT to empower low-power actors (e.g., Dennis and Garfield, 2003; Nunamaker et al., 1991), what is more theoretically intriguing is the effect that low-power actor participation has on stimulating a higher degree of idea acceptance.

In relation to our second analytical question, we found that ideas are most acceptable when they are void of any high-power or medium-power actor intervention, and are both generated and co-developed by low-power actors. Our initial analysis shows that, on average, actors with less power were better at generating strategically acceptable ideas, and this effect did not dissipate. Furthermore, when we took into account the impact of idea co-development, our results indicated that only edits from low-power actors had a positive moderating effect on acceptance, while edits from medium-power and high-power actors had no significant effect. This is an important insight and suggests that there is only a single formulation pathway for generating collectively acceptable strategic ideas; which is through the sole involvement of low-power actors in idea production and co-development to unlock the ‘trifecta’ of acceptance. As Figure 1 demonstrates, low-power actors consistently and emphatically outperform both high-power and medium-power actors in terms of generating collectively acceptable ideas. Interestingly, this finding runs polar opposite to the dominant view of strategy formulation and demonstrates an inversion of strategic influence when the power biases that inhibit participation are removed through IT-enablement.

In this regard, our study also contributes to our understanding of the role of IT as an OSF practice enabler and boundary object that facilitates the meaningful participation of low-power actors. Our results suggest that the components of IT utilized in our case eliminate the need to ‘fight power with power.’ While existing strategy process and practice research has demonstrated the importance of individual-level political assets in shaping strategic outcomes and use of IT as a medium to exclude or hinder participation (e.g., Kaplan, 2008; Mantere and Vaara, 2008), little research exists that examines its democratizing effects (Stieger et al., 2012). The components of anonymity, parallelism, group memory, and process structuring evidenced in our case, negate one’s capacity to utilize political assets to bias strategy formulation. While the question of how these components of IT explicitly mitigate power biases remains an endeavor for future research, our study offers sufficient scope for initial theorizing.

We posit that the effects of anonymity and parallelism counter traditional practices of strategy formulation that emphasize organizational role and power status as agential triggers, by ‘de-individualizing’ interactions and reducing self-focus, awareness, and accountability. Such characteristics empower low-power actors into acting outside the auspices of their institutionalized role and shadows of their power asymmetry. Furthermore, the process structuring capability of the IT used, which imposed character restrictions and a unique pairwise voting procedure, forced participants to keep their ideas and evaluation focused on content. This avoids the embedding of subject positions and linking of content to sources of legitimacy and power, thereby negating impediments to participation (e.g., Mantere and Vaara, 2008) and positional biases during evaluation (e.g., Ketokivi and Castañer, 2004; Reitzig and Sorenson, 2013). This was complemented by group memory and the collective ownership and access to all ideas, which limits “cartographic” practices of bounding a solution space through the purposeful inclusion or exclusion of ideas by powerful actors (e.g., Kaplan, 2011). Thus, IT-enabled OSF potentially simplifies the communicative aspects of the strategy formulation process, as it breaks the interdependency between skillful ‘strategy talk’ and legitimacy building strategy text (Spee and Jarzabkowski, 2011). The ideas produced and co-developed in our case did not require any contextual framing to gain recognition. In sum, our study represents an early step forward in examining the impact of IT in driving more open forms of strategy formulation. Next, we conclude our study by highlighting the limitations and directions for future research.

Conclusion and limitations

Our findings have two broad limitations that open up avenues for future research. First, the idiosyncratic nature of the organizational setting and strategic problem observed may provide an alternative explanation for our findings. Thus, an important boundary condition to the generality of our results may be the type of strategic problem analyzed (e.g., Nickerson and Zenger, 2004), which in our case represents a local problem of misalignment owing to power asymmetries. In such instances, low-power actors possess a positional advantage owing to their proximity to and experience of power asymmetries in action, and may therefore be better equipped in developing capabilities to respond (Gavetti, 2005; Nelson and Winter, 1982; Regnér, 2003). Thus, while our results run counter to the dominant view of strategy formulation by demonstrating an inversion of strategic influence that favors low-power actors, we assert that such influence, and by default strategic openness, is tethered to problem type and complexity. For example, high-power actors and actors external to the organization may be better suited at responding to more complex problems that require distant as opposed to local search (e.g., Afuah and Tucci, 2012; Cyert and March, 1963). Thus, we expect our results to hold for organizations facing similar types of problem. Future research could examine this line of inquiry more rigorously and explore the connections between strategic openness—internal versus external—and strategic problem type to empirically verify the explanations we offer.

Second, our study investigates the one-time discrete deployment of IT-enabled OSF among a subset of organizational actors, which may have surfaced different results from those observed from a prolonged and systematic use among a wider cohort of participants. Further research that examines the sustained usage of IT-enabled OSF as a practice enabler, therefore, would offer deeper insights.

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FIGURE 1

Marginal effects of low-power edits

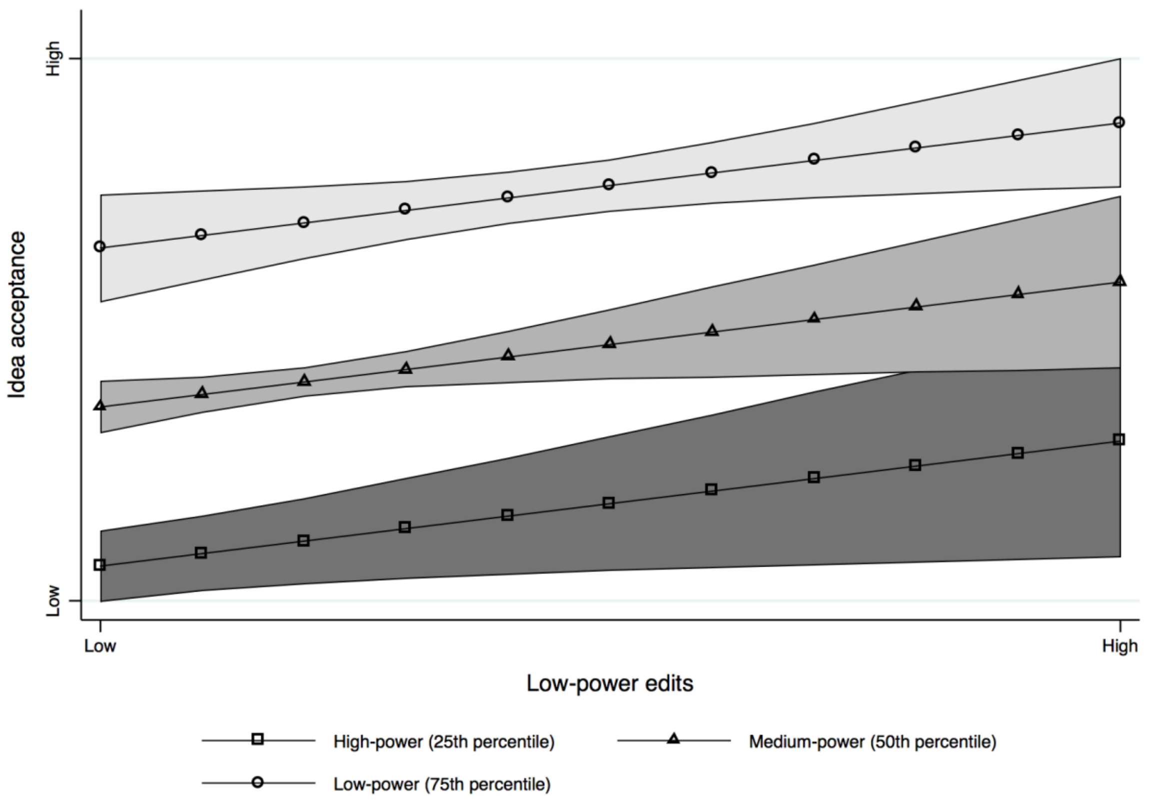


TABLE 1

Results of peer-rating survey

	Resource contingencies			Value congruence		
Department	Mean	S.D.	Rank	Mean	S.D.	Rank
Engineering	2.67	1.43	1	3.5	2.38	3
Finance	4.29	1.76	5	4	2.31	5
HR	4.52	1.77	6	4.75	1.26	6
Operations	3.48	1.06	4	3	1.41	2
Product	2.95	1.77	2	4.25	0.96	4
Risk	3.10	1.52	3	2	1.41	1

S.D = standard deviation

TABLE 2

Descriptive statistics and correlations

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
Dependent variables																	
1. Total interactions	44.60	26.42	2	109													
2. Idea production	1.63	1.09	0	5	0.18												
3. Idea votes	37.86	26.51	2	100	0.92	0.09											
4. Idea edits	4.09	3.99	0	16	0. 18	0.06	0.09										
5. Idea acceptance	3.33	0.72	1.10	4.16	0.24	0.42	0.19	0.04									
Independent variables																	
6. Power asymmetry	6.13	2.65	1	12	0.33	0.71	0.22	-0.01	0.60								
7. Total edits	3.95	3.36	0	15	-0.10	-0.28	-0.05	0.02	0.38	-0.39							
8. High-power edits	0.43	0.74	0	3	-0.05	-0.37	-0.01	-0.19	0.05	-0.42	0.52						
9. Medium-power edits	0.62	1.00	0	5	-0.13	-0.23	-0.08	0.19	0.09	-0.33	0.68	0.01					
10. Low-power edits	1.53	2.08	0	9	-0.08	-0.15	-0.04	0.00	0.51	-0.25	0.94	0.38	0.50				
Control variables																	
11. Tenure	4.11	1.84	1	11	-0.03	-0.26	0.04	-0.08	-0.19	-0.37	0.16	0.23	0.22	0.05			
12. Gender	0.23	0.42	0	1	0.28	0.29	0.22	-0.05	0.12	0.32	-0.17	-0.19	-0.09	-0.13	-0.02		
13. Background	3.38	2.23	0	7	0.03	0.17	0.05	-0.38	0.14	0.08	0.21	0.09	0.08	0.22	0.07	-0.10	
14. Education	1.48	0.67	0	2	-0.03	0.13	-0.7	0.12	-0.02	0.12	-0.17	-0.16	0.02	-0.19	-0.18	0.02	-0.17

TABLE 3

Results of Poisson regression

	Total interactions			Idea production			Idea votes			Idea edits		
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c	Model 3a	Model 3b	Model 3c	Model 4a	Model 4b	Model 4c
Tenure	-0.000	0.030	0.026	-0.056	0.001	-0.001	0.011	0.033	0.030	-0.040	0.005	0.012
	(0.974)	(0.002)	(0.010)	(0.236)	(0.981)	(0.984)	(0.235)	(0.001)	(0.005)	(0.209)	(0.889)	(0.716)
Gender	0.379	0.252	0.238	0.335	0.048	0.029	0.395	0.298	0.277	0.056	-0.180	-0.277
	(0.000)	(0.000)	(0.000)	(0.061)	(0.805)	(0.882)	(0.000)	(0.000)	(0.000)	(0.656)	(0.191)	(0.051)
Background	0.066	0.051	0.049	0.07	0.041	0.040	0.076	0.068	0.066	-0.143	-0178	-0.205
	(0.000)	(0.000)	(0.000)	(0.116)	(0.356)	(0.871)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.003	-0.019	-0.043	0.043	0.002	-0.021	-0.040	-0.045	-0.068	0.073	0.056	-0.015
	(0.908)	(0.438)	(0.085)	(0.730)	(0.984)	(0.871)	(0.125)	(0.080)	(0.011)	(0.414)	(0.530)	(0.873)
Power asymmetry		0.058	-0.033		0.123	0.004		0.043	-0.047		0.088	-0.194
		(0.000)	(0.258)		(0.000)	(0.980)		(0.000)	(0.135)		(0.000)	(0.023)
Power asymmetry squared			0.006			0.008			0.006			0.021
			(0.001)			(0.431)			(0.003)			(0.001)
Constant	3.455	3.037	3.370	0.398	-0.476	-0.06	3.254	2.933	3.251	1.895	1.314	2.208
	(0.000)	(0.000)	(0.000)	(0.280)	(0.291)	(0.930)	(0.000)	(0.000)	(0.000)	(0.000)	(0.282)	(0.000)
Chi2	176.84	252.86	262.98	7.64	20.21	20.81	192.29	225.25	233.75	29.57	47.08	58.09
	(0.000)	(0.000)	(0.000)	(0.106)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.010	0.142	0.148	0.031	0.082	0.085	0.096	0.113	0.117	0.057	0.090	0.111
Log-likelihood	-799.141	-761.129	-756.070	-118.49	-112.21	-111.91	-902.645	-886.165	-881.913	-247.071	-238.317	-232.808
N.	81	81	81	81	81	81	81	81	81	81	81	81

TABLE 4

Results of SNA

	Low-power	Medium-power	High-power
Low-power	1.73	0.98	0.42
Medium-power	1.68	0.86	0.43
High-power	1.25	0.66	0.33

Based on Pearson's test of independence ($\chi^2 = 0.04$) we conclude that the deviation from randomness is statistically significant.

TABLE 5

Results of OLS regression

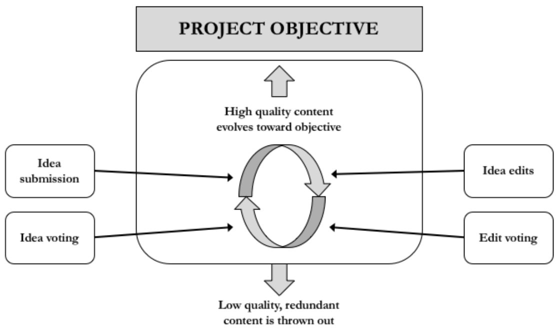
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Tenure	0.057 (0.223)	0.015 (0.528)	0.019 (0.416)	0.025 (0.294)	0.031 (0.178)	0.102 (0.4335)	0.016 (0.471)
Gender	0.141 (0.474)	-0.094 (0.340)	-0.067 (0.498)	-0.133 (0.243)	-0.119 (0.220)	0.101 (0.860)	-0.097 (0.293)
Background	0.039 (0.374)	-0.037 (0.074)	-0.034 (0.107)	-0.033 (0.111)	-0.037 (0.065)	-0.005 (0.966)	-0.032 (0.101)
Education	0.028 (0.822)	-0.014 (0.816)	0.010 (0.872)	0.001 (0.980)	0.035 (0.548)	-0.629 (0.134)	-0.009 (0.865)
Power asymmetry		0.229 (0.000)	0.329 (0.000)	0.196 (0.000)	0.186 (0.000)	-0.092 (0.350)	0.227 (0.000)
Total edits		0.176 (0.000)	0.176 (0.000)	0.129 (0.000)	0.126 (0.000)	2.093 (0.000)	0.166 (0.000)
Power asymmetry squared			-0.007 (0.164)				
Power asymmetry × total edits				0.010 (0.058)			
Power asymmetry × low-power edits					0.019 (0.003)		
Power asymmetry × medium-power edits					-0.009 (0.298)		
Power asymmetry × high-power edits					0.005 (0.618)		
Rho							-0.504
Sigma							0.318
Lambda							-0.160 (0.064)
Constant	3.361 (0.000)	1.044 (0.00)	0.688 (0.047)	1.126 (0.000)	1.139 (0.000)	-0.682 (0.550)	1.101 (0.000)
Chi2	0.575	41.68 (0.000)	36.58 (0.000)	37.82 (0.000)	36.03 (0.000)	139.19 (0.000)	261.03 (0.000)
R2	0.044	0.801	0.808	0.813	0.837	0.788	
Log-likelihood						-18.738	-35.705
Mean VIF	1.05	1.23	8.56	2.49	2.35		
N.	81	81	81	81	81	129	129

APPENDICES

Appendix A. Details of the technology's idea generation process

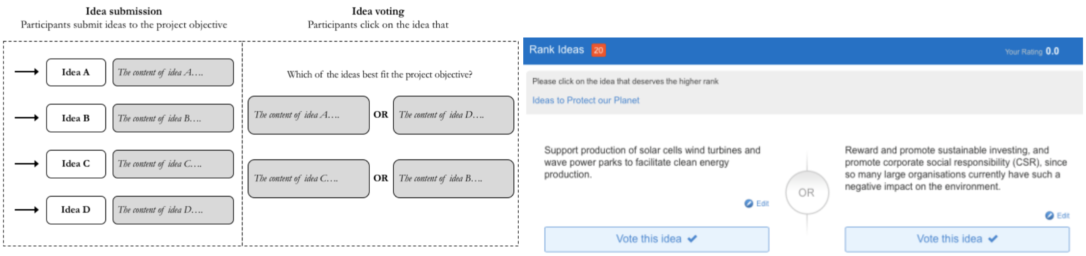
Each strategic project has a specific objective that all subsequent participation is geared towards achieving, which in our case was: *What are the key strategic issues that need to be addressed (and how) in order to plan and align the activities of the organization to the overall corporate internationalization strategy?* Four activities drive the process: (1) idea submission (production); (2) idea voting (evaluation); (3) idea edits (co-development); and (4) edit voting (evaluation). As Figure S1 illustrates, the system receives new ideas, promotes good ideas, throws out bad ideas, receives new edit suggestions, incorporates good edit suggestions, throws out bad edit suggestions, evolves thousands of ideas into a manageable set, and tracks user participation in terms of content contribution and contributions to the evaluation process.

Figure S1. Visualization of the idea generation process



Participants add ideas into the system in relation to the project objective (see left frame of Figure S2). They are then presented with pairs of ideas to evaluate with respect to its fit with the project objective (see right frame of Figure S2). The objective sponsor may also impose specific evaluation criteria to participants outside of the platform to direct their evaluations. The system samples pair choices for each participant, ensuring that all ideas are given a proportionate number of votes across a significant number of users. The vote results are then collated and processed to generate idea rankings, which evolve as participants vote over the duration of the project. A proprietary ranking algorithm optimizes ideas rankings with respect to all the votes cast.

Figure S2. Visualization of idea submission and idea voting



In parallel, users are free to edit each other's ideas. The size of the edit is restricted to a 30% change as measured by a difference algorithm to ensure all ideas are co-developed progressively. All suggested edits are 'pending' as potential next generation content until one of the competing versions wins and is promoted to the next live version. The winner is determined by a separate pairwise voting process, whereby participants are presented with versions of ideas, i.e., pairs of idea edits, to evaluate. Users click on the version that, in their opinion, best fits the stated objective. As votes are collected, competing versions are ranked (Figure S3) accordingly until a certain vote threshold is reached, at which point a winner is chosen and promoted to be the new live version. This process can result in multiple idea generations over time as illustrated in Figure S4.

Figure S3. Visualization of idea ranking board

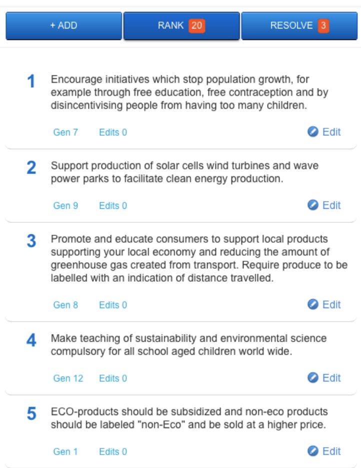
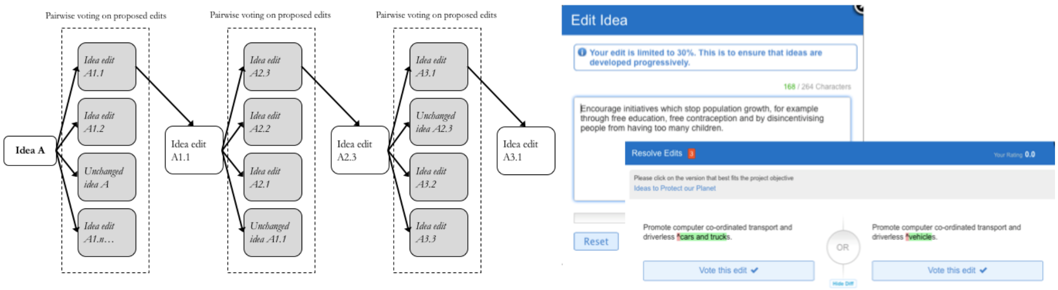


Figure S4. Visualization of idea editing



Thus, voting drives the continual ranking of ideas against each other. Editing and voting on edits incorporates the best edit suggestions into existing ideas, pushing ideas closer to local maxima. The content of good ideas is therefore co-developed incrementally to become more competitive among the collective. As ideas evolve, they are re-assessed against new and existing ideas and only the very best ideas survive.

Appendix B. Details of robustness checks

Table S1 provides a robustness check of the Poisson regression results by creating two new dummy variables. We created a dummy variable that distinguishes between low-power and high-power actors by isolating actors at the top 75th percentile of power asymmetry and coding them with a value of 1 and replacing the continuous *power asymmetry* variable. We also created another dummy variable that accounts for the effect of low-power actors from peripheral departments that may occupy operational and middle management positions and other actors in managerial positions. We code the variable 1 for actors in managerial positions and 0 otherwise. The results corroborate our main findings presented in the paper and reaffirm the superior productivity of low-power actors in idea production and co-development. Evaluation activity in idea votes was not significantly different across low-power and high-power actors. Exact p-values are reported in parentheses.

Table S1. Robustness checks for Poisson regression

	Model 1	Model 2	Model 3	Model 4
Tenure	0.007 (0.434)	0.039 (0.409)	0.018 (0.077)	-0.011 (0.745)
Gender	0.430 (0.000)	0.272 (0.147)	0.479 (0.000)	-0.040 (0.759)
Background	0.070 (0.000)	0.049 (0.276)	0.087 (0.000)	-0.170 (0.000)
Education	-0.003 (0.918)	0.069 (0.582)	-0.044 (0.103)	0.148 (0.111)
Power dummy	0.119 (0.001)	0.425 (0.019)	0.061 (0.106)	0.393 (0.001)
Management dummy	-0.303 (0.000)	0.078 (0.694)	-0.440 (0.048)	0.089 (0.475)
Constant	3.398 (0.000)	0.108 (0.778)	3.232 (0.000)	1.500 (0.000)
Chi2	235.61 (0.000)	12.69 (0.048)	280.81 (0.000)	42.48 (0.000)
R2	0.104	0.053	0.142	0.081
Log-likelihood	-762.989	-114.103	-851.618	-238.780
N.	81	81	81	81

Table S2 provides a robustness check of the OLS regression, which examines the impact of participation patterns on idea acceptance. We re-run the OLS regression whilst including a the *Management dummy* variable used in Table S1 that accounts for the potential effect of actors in managerial positions. Again, the results corroborate and provide further support for our findings.

Table S2. Robustness checks for OLS regression

	Model 1	Model 2	Model 3	Model 4
Tenure	0.014 (0.528)	0.017 (0.457)	0.024 (0.306)	0.032 (0.145)
Gender	-0.050 (0.613)	-0.041 (0.681)	-0.072 (0.463)	-0.061 (0.516)
Background	-0.029 (0.163)	-0.028 (0.178)	-0.026 (0.214)	-0.027 (0.171)
Education	-0.012 (0.838)	0.003 (0.960)	0.002 (0.971)	0.043 (0.434)
Power asymmetry	0.223 (0.000)	0.290 (0.001)	0.193 (0.000)	0.177 (0.000)
Total edits	0.171 (0.000)	0.172 (0.000)	0.128 (0.000)	0.123 (0.000)
Management dummy	-0.168 (0.086)	-0.137 (0.189)	-0.154 (0.111)	-0.251 (0.009)
Power asymmetry squared		-0.005 (0.393)		
Power asymmetry × total edits			0.010 (0.075)	
Power asymmetry × low-power edits				0.020 (0.001)
Power asymmetry × medium-power edits				-0.015 (0.097)
Power asymmetry × high-power edits				-0.000 (0.971)
Constant	1.106 (0.000)	0.863 (0.020)	1.176 (0.000)	1.242 (0.000)
Chi2	37.34 (0.000)	32.62 (0.000)	34.30 (0.000)	33.39 (0.000)
R2	0.811	0.813	0.821	0.856
N.	81	81	81	81